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Administration and Management

Managing the Provision of Environmental Information, NWSPD 1-10

GIS/GEOSPATIAL ENVIRONMENTAL DATA

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1 Introduction

The use of Geographic Information Systems (GIS) and geospatial data technology has increased dramatically in the last several years. Exploiting innovative capabilities of the NWS workforce can help leverage this technology to increase the benefits to the U.S. in life, property, and the economy. Additionally, NWS external partners and users use GIS to support their missions including response to disasters, profit-generating businesses, and life-saving missions. As a result, these entities repeatedly provide NWS with requirements for data in GIS compatible formats so the data can be seamlessly ingested into their systems independent of platform operating system, development software, and/or native data format. As with every new opportunity, there are important factors which need to be considered to ensure effectiveness. This Instruction provides process guidelines intended to ensure NWS geospatial data and applications are developed, managed, and disseminated in a manner that adheres to appropriate U.S. government policies, international data standards, and maximizes the effectiveness of the NWS.

2 NWS Approach for Providing Geospatial Data and Applications

The NWS approach to providing geospatial data and applications includes data access by subscription or individual download as well as tools and applications for data collection and discovery. Taking this balanced approach to create and provide data in Open Geospatial Consortium (OGC®) formats optimizes the rapid delivery of critical environmental data and services to Emergency Managers, electronic media, and other core partners as well as to the public. According to the OGC web site:

> *"The Open Geospatial Consortium (OGC) is an international industry consortium of 440 companies, government agencies and universities participating in a consensus process to develop publicly available interface standards. OGC® Standards support interoperable solutions that "geo-enable" the Web, wireless and location-based services and mainstream IT. The standards empower technology developers to make complex spatial information and services accessible and useful with all kinds of applications." OGC*

2.1 Supports for NWS "Core Partners"

NWS recognizes that we have a special mission responsibility for our "core partners" (emergency management community; domestic and international government partners; electronic media). This subset of the NWS user community requires timely information wherever they are, through multiple channels of dissemination, in data formats compatible with their application and decision support services. It is vitally important that these core partners have access to unaltered NWS data/products to ensure successful interaction between these partners and our field forecasters. In addition, these core partners require tools to facilitate two-way information sharing with NWS. Consideration for the special needs of this user community will be given in applying the decision process in section 3, below, with the intent of maximizing NWS flexibility in developing geospatial data and applications (OGC OpenGeospatial web services, downloadable kml/kmz and shapefiles, etc.) to efficiently and effectively meet core partner needs.

2.2 Downloadable Open Geospatial Consortium (OGC) Data

Historically the most common means for acquiring geospatial data has been has been via data access points such as File Transfer Protocol (FTP) or web links where users pull data from a NWS server to the client platform for manipulation. Since most of NWS data is dynamic and time-sensitive (i.e., requires periodic refresh), users need to routinely return to NWS access points to retrieve updated data sets (e.g., hurricane track forecasts need to be re-downloaded each time a new forecast is issued).

2.2.1 NWS Geospatial data for download will be discoverable by links on NWS GIS Data Portal

2.2.2 Ensure that NWS Geospatial data for download are in OGC compliant data formats with exceptions for Shapefiles as noted below

2.2.3 Shapefiles are not an official OGC standard, but are included as a NWS standard format because they have an open and published specification and are an industry standard due to their regular use for more than 20 years.

2.2.4 At a minimum, shapefiles including all subfiles (e.g. dbf, .shp, .shx, and .prj) will be compressed (e.g. .zip) with a common file name prefix for download. Shapefiles are a vector file format developed by ESRI and store data as points, lines or polygons.

2.2.5 Shapefile development and dissemination will follow shapefile best practices available as an appendix to this document

2.2.6 A KML file (Keyhole Markup Language) is an XML file recognized and displayed by GIS viewers (e.g. Google Earth). KML 2.2 is the only version adopted as an OGC standard.

2.2.7 KML 2.2, or currently adopted OGC standard KML version is the preferred KML version to be used by NWS when serving KML data.

2.2.8 Google Earth 6.1 or greater requires strict adherence to the KML 2.2 standard. Thus Google Earth 6.1 or higher is required to be used in testing standard compliance of all NWS KML data sets to be served.

2.2.9 KMZ is the compressed form of KML and may be used in NWS as long as the compressed file is KML 2.2

2.3 OGC Compliant Open Geospatial Web Services

The World Wide Web Consortium (W3C) defines a "Web service" as "a software system designed to support interoperable machine-to-machine interaction over a network." In other words, a user can connect to a web service and have data stream into their local system or application. The following OGC web service types are to be supported:

- Web Map Services (WMS)
- Web Feature Services (WFS)
- Web Coverage Services (WCS)

2.3.1 Ensure that services serve current data in order that users (internal and external) can load the service to their application and have confidence of receiving current and authoritative NWS data.

2.3.2 It is of extreme importance to use OGC compliance testing tools in ensuring that the OGC Web services are fully compliant with the standards.

2.3.2.1 Ensure that all NWS geospatial web services conform to ONE of the following OGC web services:

- Query able Web Mapping Service (WMS) current OGC standard version, WMS 1.3.0 as of September 2012.Web
- Web Feature Service (WFS) current OGC standard version, WFS 1.1.0 as of September 2012
- Web Coverage Service current OGC standard version, WCS 2.0.0 as of September 2012

2.4 Outreach/Education about Environmental Data available in Geospatial Formats

2.4.1 NWS will provide the public with links to information about the data provided in geospatial formats and provide links to more information on geospatial data formats and their uses.

2.4.2 NWS will register GIS products on the NOAA GeoPlatform, data.gov, and the Federal GeoPlatform for maximum user awareness of data availability

3 Development/Implementation of New Geospatial Data and Applications

GIS desktop applications written for analysis, display or data conversion by WFOs, regional and national centers for their own use are beyond the scope of this document.

A proposal for development/implementation of a new geospatial data provision or application, including geospatial web portals and viewers and all variations of geospatial web services (WMS, WCS, WFS) will be provided to the office of the CIO, through the Geospatial Integrated Work Team, prior to initiation of development/ implementation. A decision on whether or not to pursue development/implementation of new geospatial data provision or applications (map services, downloads, tools, portals, viewers, etc.) Will be made after review to ensure it is in mission scope, encourage/identify projects for cross-agency collaboration and minimize duplication of efforts. Applications include, but are not limited to, data viewers, data portals, models or tools created to extend GIS software functionality, and customizations to basic software or web-based tools. The decision on whether or not to proceed with proposed activities will be made by a Deciding Official (see section 4.3), before development/implementation of the service is pursued. Appendix C details the proposed process.

3.1 Policy Compliance

Ensure that new geospatial data and applications conform to U.S. Government policies:

3.1.1 NOAA's Policy on Partnerships in the Provision of Environmental Information (NAO 216-112) – NWS will adhere to NAO 216-112 in developing new geospatial data and applications. In particular:

3.1.1.1 As stated in NAO 216-112, NWS "will take advantage of existing capabilities and services of commercial and academic sectors to support efficient performance of NOAA's mission and avoid duplication and competition in areas not related to the NOAA mission. NOAA will give due consideration to these abilities and consider the effects of its decisions on the activities of these entities, in accordance with its responsibilities as an agency of the U.S. Government, to serve the public interest and advance the nation's environmental information enterprise as a whole."

3.1.1.2 In accordance NAO 216-112, ensure that the public has the opportunity to provide input on any proposed new geospatial application. Procedures for seeking input are described in NWSPD 1-10 and NWSI 10-102. Input from a public comment/review period will be considered in making a decision on whether or not to pursue implementation of the proposed application. New geospatial applications will not be provided external to NWS until this decision has been reached.

3.1.2 NOAA's Policy on the Management of Environmental and Geospatial Data and Information (NAO 212-15) - NWS will adhere to NAO 212-15 in managing and providing geospatial data and information In particular:

3.1.2.1 As stated in NAO 215-12 NWS geospatial data "will be visible, accessible and independently understandable to users, except where limited by law, regulation, policy (such as those applicable to personally identifiable information or protected critical infrastructure information or proprietary trade information) or by security requirements."

3.1.2.2 In accordance with NAO 215-12, NWS will work with core partners and users to obtain requirements and feedback as well as provide complete data management plans which include coordination with NOAA data centers and data management systems with details of secure storage and archive delivery. Metadata according to Federal standards will be provided with all data.

3.1.3 NOAA's Policy on Requirements Management (NAO 216-108) – NWS will adhere to NAO 216-108 in developing and collecting requirements for new geospatial data and applications. In particular:

3.1.3.1 As stated in NAO 216-108 NWS geospatial data and application "requirements are driven from internal or external sources. The mission requirements will identify user needs, enabling science and technology developments, and/or other opportunities that support NOAA's mission and goals. Program managers shall review and propose additions, deletions, or modifications to the existing mission requirements baseline."

3.1.3.2 In accordance with NAO 216-108 requirements will be validated at least annually through a review for compelling requirement driver(s), consistency with NOAA mission, clear benefits for users and core partners, and are scientifically and technically feasible.

3.1.4 Other Applicable Policies include:

- Web
- Internet Use
- Privacy
- NWS, NOAA, and DoC IT Security policies
- Section 508 of the Rehabilitation Act of 1973
- Information Quality Act Guidelines
- Records Retention Requirements
- NWSPD 1-12, *Managing the Acquisition of Environmental Data from External Parties* – if the service is used to acquire information
- Technology transfer, NWSPD 100-4 – for technology solutions implemented external to NWS (e.g., mobile phone "apps")
- Executive Order 13166, Limited English Proficiency

3.2 Legality

- Ensure that use of commercial services to support the proposed geospatial environmental data or application has an end-user license or agreement approved by the General Services Administration and the Department of Commerce Office of the General Counsel.
- Ensure an analysis has been completed to determine the extent to which (if any) functionality of the proposed geospatial environmental data or application is subject to existing patent restrictions (i.e., does any functionality infringe on rights established by existing patents).

3.3 **Waiver for Proprietary Solutions.** Development of geospatial applications will be platform/service agnostic whenever possible. To develop a NWS geospatial environmental application which requires technologies which are not vendor-neutral, a specific waiver is

required to be granted by the Assistant Chief Information Officer.

Scientific validation and technical merit – The proposed application receive scientific approval from the OST director or his designate (see NWSPD 80-5) mission Benefits – The analysis will include identification of how the proposed data or application will improve support for carrying out the NWS mission.

3.4 **Documentation –** Ensure that all geospatial data is accompanied by metadata in accordance with Federal Standards. Analysis of applications will provide resources for providing documentation on the new geospatial application.

3.5 **Operational Sustainability –** The analysis will include identification of the office[s] responsible for maintenance, updates, patches, user support services, etc., life cycle costs, and expected impacts on NWS systems and telecommunications.

3.6 Scope of Development - To foster consistency of services across NWS, local/regional development efforts should be applied to improvement of nationally consistent NWS services unless specifically addressing a unique local/regional user need (see NWSI 10-102).

4 Authorities and Responsibilities

4.1 **Assistant Chief Information Officer –** The OCIO sponsored Geospatial Integrated Work Team (GIWT) will analyze the policy and management factors (described in section 3, above) associated with development/implementation of NWS geospatial data and applications. This analysis will be provided to the Deciding Official to support the decision process. Appendix C outlines the analysis process.

4.1.1 The GIWT may create or use existing working groups to support the analysis. Expertise needed to support a thorough analysis should include views from individuals in the following areas: policy, legal, technical, knowledge of field operations, the NWS labor organization, etc.

4.1.2 The GIWT may determine at what stage in the development/implementation process a decision is needed (e.g., prototyping of new capabilities may be needed to perform a thorough analysis).

4.2 **The Deciding Official –** The Assistant Chief Information Officer for the National Weather Service is the Deciding Official responsible for approving the development/implementation of a new geospatial application.

4.2.1 The Deciding Official will review the GIWT analysis (section 4.1) to determine whether the expected benefits to the NWS mission justify the expected costs of the new geospatial service or application. The Deciding Official also will consider the input from public comment/review (see 3.1.1.2 above) in determining whether the proposed new geospatial application will be developed/implemented, and may confer with other NWS,

NOAA, or Department officials and NWSEO (e.g., by seeking the advice of the NWS Corporate Board) in reaching their decision.

4.2.2 The decision will be recorded in a decision memorandum and should include an explanation that is responsive to comments received from public comment/review. The decision memorandum will be posted in the public database of proposed changes to NWS information services (see NWSI 1-1001).

APPENDIX A - References and Definitions

References

NWSPD 1-10 – Managing the Provision of Environmental Information
NWSI 1-1001 - Tracking and Public Notification of Proposed Changes to NWS Information Services
NWSI 10-102 – New or Enhanced Products and Services
NWSI 10-103 – Operations and Services Improvement Process Implementation
NWSPD 80-5 – Science Review and Approval
NAO 212-15 – Management of Environmental Information
NAO 216-108 = Requirements Management
NAO 216-112 – NOAA's Policy on Partnerships in the Provision of Environmental Information (NAO 216-112)

Definitions (as applied in this instruction)

Geospatial application– a software application ("app") which processes geospatial data Geospatial applications may perform an analysis on data, fusing of data, or queryable viewing of data usually on a computer or mobile device based map.

NWS "Core Partner" –

The National Weather Service (NWS) has defined a classification of its users which it terms "core partners." This class of users is defined as:

> "Government and non-government entities which are directly involved in the preparation, dissemination and discussions involving hazardous weather or other emergency information put out by the National Weather Service."

While there are a large number of individuals who contribute to the overall services provided by NWS, all of whom play key roles in providing quality services to the public, this "core partner" designation is meant to identify those entities which have a unique need for assured access to unaltered NWS information because of the level of interaction they have with NWS personnel.

NWS "core partners" consist of the following three groups of individuals:

a. Member of the emergency management community. This includes public safety officials who serve as employees or contract agents of a government agency at the federal, state, local, or tribal level and are charged with protecting the public from hazards that are influenced by weather or weather-related events. Other members of this community include: safety and emergency personnel, from universities or other large entities with large populations whose roles are functionally equivalent to the public safety officials

described above, Skywarn Net Control Operators, such as Amateur Radio Emergency Services (ARES) and Radio Amateur Civil Emergency Services (RACES).

b. Government Partners. Federal/state/local government partners who have missions that require close coordination with the NWS. Government partners include (but not limited to) the FAA, and water and land management officials.

c. Members of the electronic media. Members of the electronic media are parties, and contract agents of parties, who have a need to actively participate in discussions with NWS forecast offices on imminent weather or other hazards, and operate systems that routinely and rapidly relay locally issued watches, advisories, warnings and forecast information to a significant part of the population served by an NWS office. Electronic media includes providers of weather content through electronic information distribution such as radio, television, internet, cellular, and other wireless means.

Note: Individuals, companies, or other entities involved in 'chasing' weather events and posting or streaming video or pictures of the event, but do not otherwise have a need to communicate with NWS do not meet the "core partner" standard. In addition, NWS spotters, while playing a key role in providing information to our forecast offices are not included in the "core partner" classification as they do not routinely require assured access to unaltered NWS products to fulfill their function as a spotter.

At this time, the "core partner" designation has been used to distinguish those users who meet the need for user accounts for the NWSChat service (see https://nwschat.weather.gov/) and the experimental iNWS service (http://inws.wrh.noaa.gov/).

APPENDIX B - Best Practices for geospatial standard data and application development

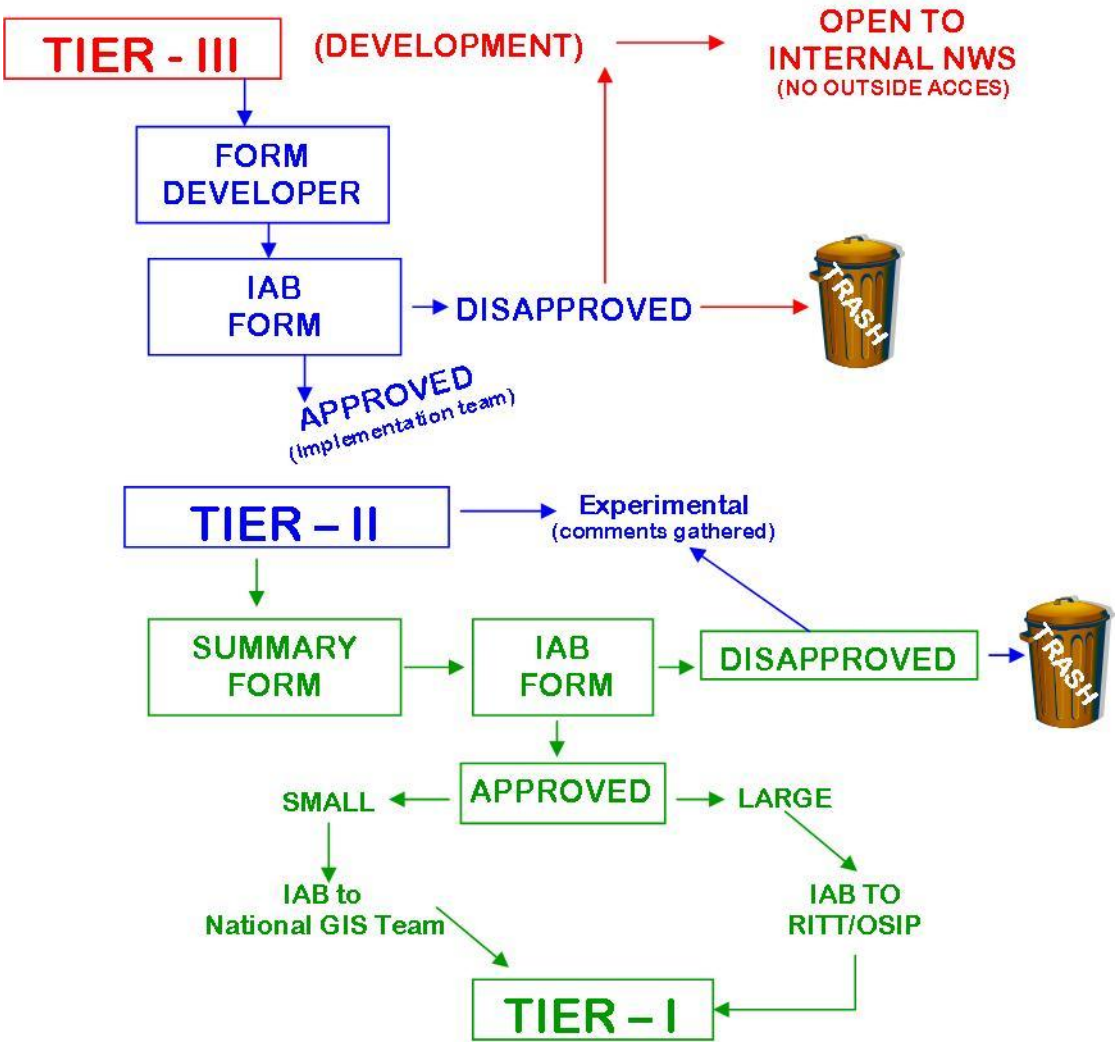
Shapefiles

- Include only one shapefile in a .zip archive.
- Zip file name should match the prefix of the filenames in the zip file
- Include no more than 1,000 shapefile features in your file.
- In some cases, when you attempt to add a file with fewer than 1,000 features, you see an error message that the shapefile is too big to add to the map. This occurs when the extracted data is too big to display in a web browser. Often, generalizing the features will reduce the overall size and allow the shapefile to be added to the map. If that doesn't work, you may need to create a feature service with ArcGIS for Server.
- The shapefile should contain valid geometries. All NWS field offices have access to ArcGIS Desktop software which contains a Repair Geometry tool to correct invalid geometries
    - Learn more about correcting invalid geometries
- Include in the shapefile the accompanying .prj file in which the coordinate system of the data is defined.
    - Do not assume a coordinate system, research the origin of a shapefile, there are AMS pre-prints and textbooks available as resources.
    - Learn more about defining coordinate systems

APPENDIX C - Proposed Geospatial Data/Application Review Process

The review process described in the NWS Geospatial Directive will be implemented in the following manner:
Statement of Work (using OSIP template) completed for new data, application or service and submitted to the GIWT on the Thursday prior to a scheduled GIWT meeting (As of September 2012, 2nd and 4th Mondays of each month).
GIWT team members (each office and region should have identified a primary and alternate to the team) will be notified and given the opportunity to review.
Comments will be taken the following responses will be provided within 48 hours of the GIWT meeting.

- Approve , Begin work (for web services the workflow is outlined in figure 1)
    - Web/server work will be overseen by the server/web administrators (according to figure 1)
    - New applications will be directed to the appropriate NWS approving/project management process
    - Data will be provided direction for registering/providing links for the NOAA & NWS "one-stop" locations
- Conditionally approve
    - Work may begin but in collaboration with a parallel effort
    - Work may begin once the concerns of the GIWT have been satisfactorily addressed
- Disapprove because
    - Is not in compliance with the policy
    - Functionality/OGC Data is already being provided
    - Other _____ (to be filled in by the team)


TIER - III
(DEVELOPMENT)
OPEN TO
INTERNAL NWS
(NO OUTSIDE ACCES)
FORM
DEVELOPER
IAB
FORM
DISAPPROVED
TRASH
APPROVED
(implementation team)
TIER – II
Experimental
(comments gathered)
SUMMARY
FORM
IAB
FORM
DISAPPROVED
TRASH
APPROVED
SMALL
LARGE
IAB to
National GIS Team
IAB TO
RITT/OSIP
TIER – I